WHAT IS CLAIMED IS:

1. A module for use in a compact fuel processor, comprising:
a module inlet for receiving a feed stream;
a module outlet for producing an effluent stream;
a reactor having a reactor inlet, a reactor outlet, and catalyst bed forming a fluid communication conduit between the reactor inlet and the reactor outlet;
wherein the module inlet is in fluid communication with the reactor inlet and the module outlet is in fluid communication with the reactor outlet; and
wherein the combination of module inlet and module outlet form a heat exchanger for heating the feed stream against hot reactor product prior to being introduced to the reactor inlet.

2. A module for use in a compact fuel processor, comprising:
a module inlet for receiving a feed stream;
a module outlet for producing an effluent stream;
a reactor having a reactor inlet, a reactor outlet, and catalyst;
an inlet spiral passage in fluid communication with the module inlet to the reactor inlet; and
an outlet spiral passage in fluid communication with the reactor outlet to the module outlet;
wherein the feed stream is introduced to the module inlet, passes through the inlet spiral passage, and is heated by hot reactor product passing through the outlet spiral passage.

3. The module described in claim 2, wherein the reactor is a fixed bed reactor.

4. The module described in claim 2, further comprising a flow distribution manifold in fluid communication with the reactor inlet for evenly distributing flow into the reactor.

5. The module described in claim 4, further comprising a flow collection manifold in fluid communication with the reactor for directing the hot reactor product to the reactor outlet.

6. An autothermal reforming module for use in a compact fuel processor, comprising:

a module inlet for receiving a feed stream;

a module outlet for producing an effluent stream;

a fixed bed reactor having a reactor inlet, a reactor outlet, and autothermal reforming catalyst;

an inlet spiral passage in fluid communication with the module inlet to the reactor inlet;

an outlet spiral passage in fluid communication with the reactor outlet to the module outlet;

a flow distribution manifold in fluid communication with the reactor inlet for evenly distributing flow into the reactor; and

a flow collection manifold in fluid communication with the reactor for directing hot reactor product to the reactor outlet;

wherein the feed stream is introduced to the module inlet, passes through the inlet spiral passage, and is heated by the hot reactor product passing through the outlet spiral passage.

7. The autothermal reforming module described in claim 6, wherein the autothermal reforming catalyst includes supported catalyst particles.

8. The autothermal reforming module described in claim 6, wherein the autothermal reforming catalyst includes monoliths.

9. The autothermal reforming module described in claim 6, wherein the autothermal reforming catalyst includes a partial oxidation catalyst.

10. The autothermal reforming module described in claim 9, wherein the autothermal reforming catalyst includes a steam reforming catalyst.

11. The autothermal reforming module described in claim 6, wherein the feed stream is a mixture of air, steam, and hydrocarbon fuel.